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ABSTRACT

This paper presents the outcome of research that deals with the development and use of World Wide Web hypermedia courseware in student teachers' education in the Department of Information Science at the Faculty of Philosophy, University of Rijeka (Croatia). The purpose of this research is to explore how the use of Web courseware improves the students' learning process as well as their comprehension. The results of a questionnaire about the effectiveness and quality of the courseware and the level of student acceptance of courseware as a teacher resource are presented. The criteria regarding evaluating the effectiveness of the courseware were grouped into five areas: content and instructional design; media elements and aesthetics design; navigation; communication; and evaluation. (Contains 12 references.) (Author/MES)

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Evaluating the Use of World Wide Web Courseware in Student Teachers' Education: a Case from Croatia

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Abstract: This paper presents the outcome of the research that deals with the development and use of the WWW hypermedia courseware in student teachers' education at the Department of Information Science at the Faculty of Philosophy in Rijeka (Croatia). The purpose of this research is to explore how the use of WWW courseware improves the students' learning process as well as their comprehension. In this paper we present the results of the questionnaire about the effectiveness and quality of the courseware and the level of student acceptance of courseware as a teaching resource.

Introduction: Computer Technology in Croatia

In the countries throughout the world new methods and means are used to improve education, and special attention is being paid to the role of computer technology in this process. To achieve improvement with the computer technology, it is necessary to educate teachers, introduce new teaching and learning model, and develop appropriate teaching and learning materials: software for learning – courseware. While in some countries these efforts are strategically planned, in others, such projects represent isolated initiatives and modest attempts which merely have a goal to build computer infrastructure and give schools and universities access to the Internet.

This kind of situation holds for Croatia, where there are still no major projects for the introduction of computer and networking technology in education at the governmental level. Currently underway is the preliminary phase, conducted by the Ministry of Science and Technology and the Ministry of Education and Sport which would enable the development of the computer infrastructure and give Internet access to universities and schools via the Croatian Academic and Research Network (CARNet), an academic and research part of the Internet in Croatia (CARNet 1997).

Today, CARNet connects all four university centers in Croatia (Osijek, Rijeka, Split and Zagreb). In the next phase, the Internet access will be given to the primary and secondary schools and the process of building the computer infrastructure in the schools has been already started.

In addition to our non-adequate hardware and network outfit, the problem is that in Croatian schools and universities computers are used rarely, except in the subjects related to computer science. We consider that special emphasis of the role of computer technology in education (especially using WWW courseware) should be put at the colleges that educate student teachers. We hope that these students will use the computer

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Before the project described in this paper was implemented, the research has been conducted in the context of the projects supported by the Croatian Ministry of Science and Technology: 'Innovations in Computer Assisted Education' and 'Quality of Teaching in Higher Education'.
The research titled 'Innovations in Computer Assisted Education' was conducted from 1990-1996. The project involved exploring information technologies that would have a large impact on the use of computers in education. Of particular interest was the research in hypertext, hypertext databases and hypermedia (Hoic-Bozic, 1997).
The second research project 'Quality of Teaching in Higher Education' started in November 1996. The main goal of the project is to explore the quality of teaching at the Croatian universities, and to develop a model for improving teaching and learning at the Croatian universities.
The project 'Transforming Information into Knowledge: Online Courses in Education' has been supported by the Research Support Scheme of the Open Society Support Foundation.
The purpose of this research is to explore how the use of on-line courses prepared for World Wide Web and combined with other Internet technologies improves the students' learning process as well as their comprehension.

Methodology

The research has been conducted at the Department of Computer Science on a group of senior student teachers of Computer Science (25 students) in the context of the course The Internet Seminar where they have learned how to use Internet services. The lectures have been hold in the PC-room, on the computers in the local area network connected with the CARNet.
The research method was experimental: approximately one half of the Internet Seminar course's lectures have been elaborated traditionally (lecturing supported by the use of a projector, practices on the computer set by the teacher and by equal temporal setting), while the other half have been elaborated as a WWW courseware. The students have elaborated this other half of lectures on individual basis, by their own personal tempo and, in particular, the order of the topics presented within every single lecture.

Overview of the WWW Courseware

Even before this research, simply paper-based course materials have been placed on the Web so the students can access them in electronic format. In that way the students didn't have to make their own notes by writing out from transparencies and they had more time to explore the related resources on Internet.
The WWW courseware has been developed for the subjects about World Wide Web, e-mail, mailing lists and newsgroups, and HTML. According to the survey about students' previous knowledge, with some of these subjects the most of the students have been familiar before (using browsers, e-mail) but the other was completely new for them (HTML).
As the most appropriate method to deliver the content Web/Computer Based Training has been chosen (Driscol, 1998). The WWW courseware has been developed for the subjects about World Wide Web, e-mail and e-mail clients, mailing lists and newsgroups, and HTML. The main courseware page (home page) links together the modules as well as the WWW documents with short explanations about other lectures for traditional learning.
A special attention has been paid to organization of the courseware, navigational techniques and learner-content, learner-educator and learner-learner interaction (Driscol 1998, McCormack & Jones 1997). Navigation is enabled by a number of elements. The courseware page consists of a vertical bar with navigational buttons to

allow students' access to the main courseware elements: Courseware Home Page, Module Home Page, Help, Index, Search, Webboard, E-mail, Tests (Fig. 1). Apart from these buttons, there are Back and Forward arrows added to documents describing the lessons of the modules.
The materials for the course have been published on the Web server at URL http://top.pefri.hr/mreze/ .

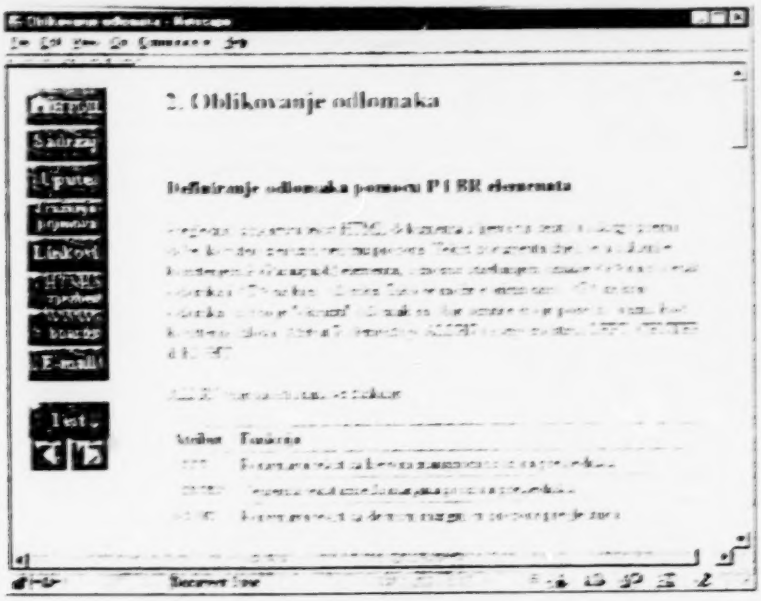

Figure 1: Example of a WWW courseware page

Results and Discussion

In order to explore the students' attitude concerning courseware usage, we developed questionnaire for students. According the experiences from the similar studies (Ciglaric & Vidmar 1997, Goldberg 1997, Zammit et al. 1999), and our own experience (Hoic-Bozic 1997, Radovan et. al. 1998), we prepared the list of statements, which were the core of the questionnaire. The students were supposed to express their opinions on the 1-5 agreement scale checking 5 if they strongly agree, 4 if they agree, 3 if they nither agree nor disagree, 2 if they disagree and 1 if they strongly disagreee with the statement.
We used the list of the criteria in two main queries:

1. effectiveness and quality of the WWW courseware
2. the level of student acceptance of the WWW courseware as a teaching resource.

Effectiveness and quality of the WWW courseware

The criteria regarding the evaluating the effectiveness of the WWW courseware were grouped into five groups: content and instructional design, media elements and aesthetics design, navigation, communication and evaluation (Hall 1997). The students were asked not only to rate the statements and to answer a few questions, but also to give their comments and suggestions about the WWW courseware.
The students answers to the statements are presented in the (Tab. 1) and (Fig. 2).
The WWW courseware had never been used before the research and the students provided a great deal of valuable insight in terms of changes that would improve the courseware. We will include the changes and improvements in the next version of the courseware.

	1	2	3	4	5	Mean
1. Content and instructional design						
Content was relevant to your knowledge level.			24%	64%	12%	3,88
Content was useful for your study.				40%	60%	4,60
Content was useful for your future work.		4%	12%	56%	28%	4,08
Content was clear and informative.			20%	48%	32%	4,12
Courseware was easy to use.			12%	72%	16%	4,04
2. Media elements and aesthetics design						
Pleasent and attractive colors.	4%		8%	64%	24%	4,04
Attractive page design.		8%	36%	40%	16%	3,64
Legible and clearly presented text.		4%	20%	48%	28%	4,00
Courseware should include more graphics.	4%	24%	40%	16%	16%	4,28
Understandable graphics (buttons).			8%	56%	36%	3,16
Courseware should include sound.	16%	16%	28%	36%	4%	2,96
Courseware should include animation.	16%	4%	44%	32%	4%	3,04
Courseware should include video.	16%	4%	56%	20%	4%	2,92
3. Navigation						
Topics of your interest were easy to find.			4%	56%	40%	4,36
Help page was necessary for navigation.	12%	44%	20%	24%		2,56
You could easily choose your own way of learning.	4%		12%	60%	24%	4,00
Courseware should include navigational map.	4%	24%	44%	28%		2,96
4. Communication						
E-mail is useful for communication with the teacher.		16%	24%	40%	20%	3,64
Webboard is useful for comm. with the teacher.		8%	32%	40%	20%	3,72
Webboard is useful for comm. with colleagues.		8%	36%	44%	12%	3,60
E-mail is useful for comm. with colleagues.		20%	36%	28%	16%	3,40
5. Evaluation						
Courseware allows to test the knowledge.		4%	44%	48%	4%	3,52
Courseware should include more exercises.			28%	60%	12%	3,84
Courseware should include final test.	4%	4%	28%	44%	20%	3,72
HTML test form was useful element of courseware.			24%	48%	28%	4,04

Table 1: Student evaluation of the effectiveness and quality of the WWW courseware

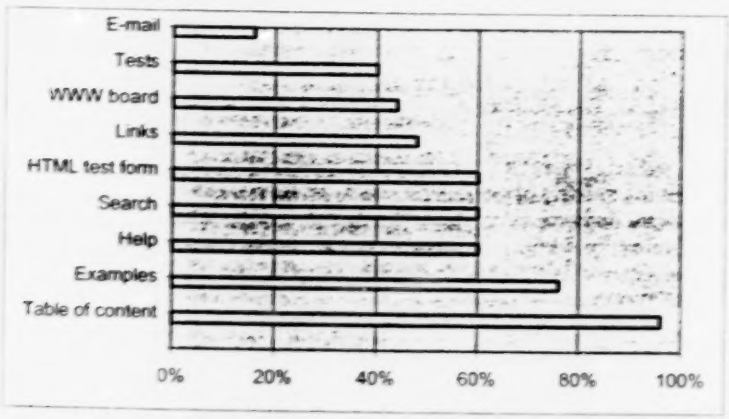

Figure 2: Student use of courseware components

Student Acceptance of the WWW Courseware

The second part of the questionnaire was administered to obtain information regarding student acceptance and reaction to the use of WWW courseware as a teaching resource, comparing it with traditional approach. The results are presented in the (Tab. 2).

	1	2	3	4	5	Mean
You were satisfied with the learning conditions.	8%	24%	56%	8%	4%	2,76
You were satisfied with the use of WWW courseware as a teaching resource.	4%		20%	60%	16%	3,84
The use of WWW courseware was effective for learning.	4%		16%	64%	16%	3,88
Compared to traditional lecturing method, you have learned more.	8%		44%	36%	12%	3,44
Compared to traditional lecturing method, you spent more time for learning.	4%	32%	40%	24%		2,84
Compared to traditional lecturing method, WWW courseware requires responsibility that is more personal.		4%	24%	56%	16%	3,84
Compared to traditional lecturing method, WWW courseware gives more opportunities for communication with the teacher.	8%	4%	40%	36%	12%	3,40
Compared to traditional lecturing method, you required more communication with the teacher.	20%	8%	48%	20%	4%	2,80
The opportunity to communicate with the teacher is important part of the courseware.		4%	36%	48%	12%	3,68

Table 2: Student acceptanceof the WWW courseware as a teaching resource

Despite the fact that the students were generally satisfied with the use of WWW courseware as a teaching resource, they did not think that they had learned more in comparison with the learning in a traditional manner. They spent less time for learning than they would have with the traditional lecturing method, because the WWW courseware requires more personal responsibility and concentration to learning. In addition, many students considered that the courseware components for communication with the teacher (e-mail, Webboard) were not very important. The students did not require more communication in comparison with lecturing. The main difficulty regarding the learning conditions was in gaining access to the computers and the courseware because our students only have access to Internet at the college.
There were 92% of students who did not lack any educational aspect included in traditional teaching. The rest missed the "live contact" with the teacher and the colleagues. If they could chose between a WWW courseware and a traditional lecturing, 76% of students will prefer courseware.

Conclusions

The paper presents the description and the results of the research which purpos is to explore how the use of WWW courseware improves the students' learning process as well as their comprehension. In order to explore the students' attitude concerning courseware usage, we developed questionnaire about the effectiveness and quality of the courseware and the level of student acceptance of courseware as a teaching resource.
The number of respondents in questionnaire was small because the research has been conducted on a group of senior student teachers of Computer Science (25 students). Because of the relatively small number of participants in the research, the results will primary help us to focus our future research efforts and to develop the strategy for introducing the WWW courseware as a teaching resource, for now as the supplementary method for traditional teaching. We would like to mention that not only this research, but also the use of WWW courseware, represents unique attempt at the University of Rijeka.
If we compare our research results with some similar projects (Bell &Kaplan 1999, Ciglaric & Vidmar 1997, Goldberg 1997, Psunder 1997, Young 1999, Zammit et al. 1999), it shows up that our students have nearly the same level of acceptance of WWW courseware as a teaching resource, regardless their different socio-cultural

background and availability of hardware. Also, as in some of the mentioned studies (Psunder 1997, Young 1999, Zammit et al. 1999), the level of computer-mediated communication between the teacher and students was low, probably because the students were not used to it. The educational strategy that we should use to increase students' participation in e-mail and Webboard discussions deserves further research.
We are quite satisfied with the results, especially because the participants are to be student teachers and we hope that they will use the WWW courseware in their future work, enabling the transfer of the new approach to education in Croatian schools.

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